Fall 1962

South Dakota Farm and Home Research

Agricultural Experiment Station

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SOUTH DAKOTA

FARM AND HOME RESEARCH

a study of social values on the pine ridge reservation

AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE COLLEGE

in this issue

SOUTH DAKOTA FARM AND HOME RESEARCH

A Report of Progress

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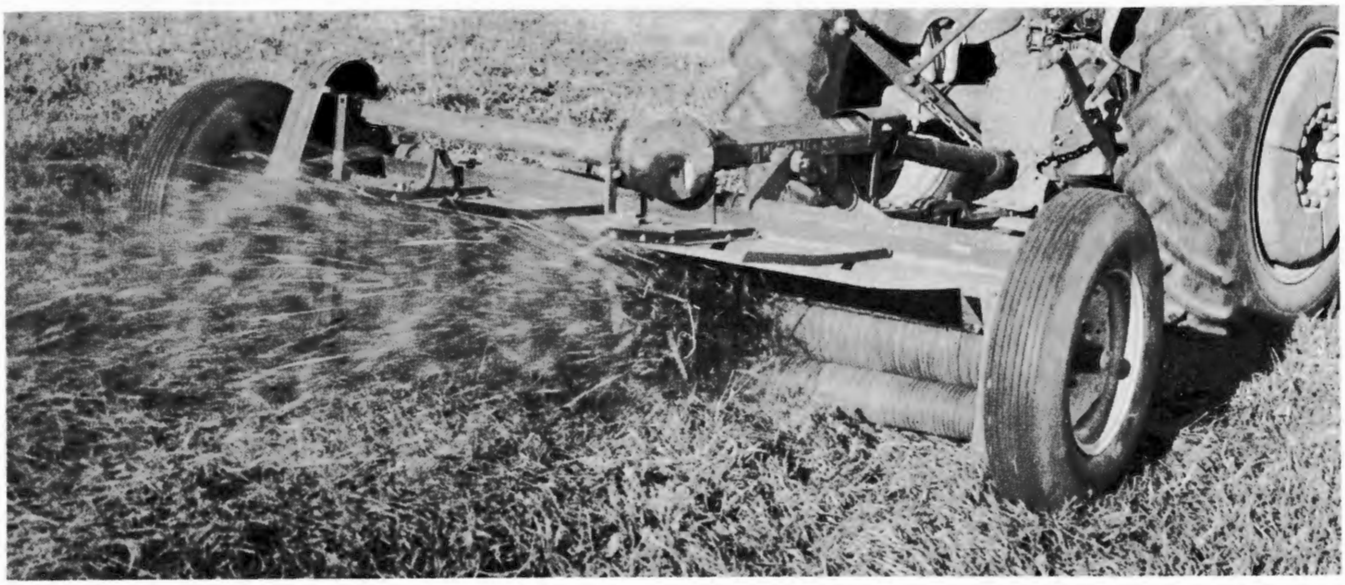


conditioning and drying hay for dairy cattle

by HOWARD VOELKER, EMERY BARTLE, and SAMUEL PERRY[1]

Weather conditions for making alfalfa hay are often not favorable, and hay is damaged, reducing feeding value.

South Dakota's lower rainfall, compared to some states, makes the problem of weather damage to most hay less severe than where there is more rain at haymaking time. However, rain damage, especially to first cutting alfalfa in Eastern South Dakota, is often serious.

South Dakota ranks sixth in the United States in production of alfalfa hay and second in wild hay production. The total hay produced in this state exceeds 5 million tons annually. If we assume that one fifth of the feeding value of such hay is lost due to poor handling methods, weather exposure, etc., this means a loss of one million tons and an average of $15 per ton, or a loss of 15 million dollars annually.

Because of the observed losses in hay curing and storing, and the economic importance of such losses, experiments were conducted. The objectives were to determine the effects of hay crushing and artificial or supplemental fan drying of alfalfa in relation to milk production value, growth of heifers, stem ratios, chemical composition, drying time, and temperatures.

Four small alfalfa fields were each measured off into three equal parts during a 2 year study. All hay was dried in the swath to about 50% moisture and then raked. One-third of it was baled and stored in the barn until feeding, and one-third was handled the same, cut at the same time, only it was crushed with a rubber-roll conditioner immediately after mowing. The other one-third was cut and conditioned the same as the rest, except that it was baled at about 30% moisture. It was then hauled to an A-frame fan drier (using cold air) and curing was completed.

Hay Sampled for Moisture

The hay was sampled for moisture at 2 hour intervals during curing to determine moisture changes. Also, samples were taken during curing for chemical analyses, and weather recordings were made. These involved temperature, humidity, wind direction and velocity, and rainfall.

Temperatures of the hay bales were checked as the hay was stored and for as long after baling as temperatures stayed higher than atmospheric temperatures. During the second year, second cutting hay was used. Hay was cut at the late bud and early bloom stage. Stem lengths averaged 14 to 17 inches. The hay land had been irrigated during alfalfa growth up to about 1 week before cutting.

Most of the hay was cured without rains,except for part of the second cutting the first year. This re-

[1]*Associate professors, and graduate assistant, respectively, Dairy Science Department*

Table 1. Hay Consumption, Milk Production, and Body Weight Changes of the Cows

Trial	hay treatment	Consumption per cow daily	4% milk per cow daily	Daily changes in body wt.
			pounds	
1	Crushed, fan-dried, no rain	21.6	33.1	+.46
1	Crushed, fan-dried, rain	21.2	28.5	+.67
1	Crushed, field-dried, no rain	22.3	33.5	+.60
1	Crushed, field-dried, rain	19.9	28.7	+.14
1	Uncrushed, field-dried, no rain	20.0	32.2	+.46
1	Uncrushed, field-dried, rain	16.8	28.6	+.05
2	Crushed, fan-dried, no rain	20.0	35.9	+.14
2	Crushed, field-dried, no rain	21.2	36.0	+.13
2	Uncrushed, field-dried, no rain	19.7	34.7	—.31

Table 2. Daily Consumption of Hays and Average Daily Gains in Weights of the Heifers

Hay type	Consumed per heifer, daily	Av. daily gains
		pounds
Uncrushed, heated in bales, field-dried, no rain	11.6*	+0.91*
Crushed, not heated in bales, field-dried, no rain	13.5	+1.51*
Uncrushed, not heated in bales, field-dried, no rain	13.4	+1.34
Crushed, fan-dried, not heated in bales, no rain	15.9*	+1.51*
Uncrushed, field cured, not heated, rained on	13.6	+1.07
Crushed, field cured, not heated, rained on	14.0	+1.15

*Highly significant, statistically.

ceived .17 inch rain, as it was cured in the field. The first year's third cutting was badly damaged by three rain showers, totaling 1.25 inches. This hay was fed seperately during the last part of the first year trial.

During the first trial 21 cows were divided into three comparable groups and fed each type of hay in a rotational plan, every cow getting some of each hay. In the second trial, hay was fed free-choice with an attempted 10% excess for stem refusal or weigh-back. Cows were fed a grain mixture according to requirements for total digestible nutrients. This mixture averaged 13.2% total protein and about 75% T.D.N.

Results of Milk Production Trials

Results of the milk production trials are summarized in table 1.

Free-choice consumption of hay showed that, on the average, cows fed crushed hay consumed 21 pounds per cow daily compared to 18.8 pounds daily for the cows fed uncrushed hay or about 11.7% more of crushed hay. However, of the rain damaged hay, cows consumed 3.8 pounds or 22.6% more crushed than uncrushed hay. The rain-damaged uncrushed hay lost a higher percentage of leaves and had to be turned with a side - delivery rake several times before baling. Crushed hay dried much quicker after the rains and was baled much sooner. Thus there was less exposure to weather.

Much of the reduced feeding value of rain-exposed hay probably occurs near the end of field drying. Crushed hay, baled and dried on the fan, even though exposed to rain, was damaged little.

Cows in both trials, fed conditioned hay with no rain, produced 1.2 pounds more milk daily than cows fed unconditioned hay with no rain. This difference shows a trend toward higher production with the conditioned hay, although the 25 day periods is not really enough time to be sure.

Cows fed rain-damaged hay produced significantly less milk, about 5.4 pounds or 18.9% less than did cows fed hay not rain damaged.

Body weight changes showed in both trials that cows fed crushed hay with no rain gained significantly more weight (about 21%) than when fed uncrushed hay. These differences, in favor of crushing, were even greater in hays rained on. Cows gained .41 pound average per cow daily when fed the crushed hay exposed to rain, and gained only .05 pound daily per cow on the uncrushed hay exposed to rain.

Heifer Trials

Two feeding trials were made, using the same hays as in the cow trials. The first trial involved sixteen heifers; the second, eleven. Three breeds—Holsteins, Guernseys, and Brown Swiss—were tested.

Hays were again fed in a rotational system so that each heifer ate each hay type. Hay was weighed into mangers daily and fed free choice with an excess of about 10% of stem refusal.

A preliminary standardization period was used before each treatment. Heifers were weighed for 3 successive days at the beginning and end of each period. The weights were averaged, to take care of some of the daily fill changes in the heifers. Hay bales which heated shortly after baling were fed separately to obtain data on effects of such heating.

Results of the first heifer feeding trial are summarized in table 2.

The trial showed that the heifers consumed 12.4% more crushed than uncrushed hay. This was highly significant. The greatest differences in body weights were in the crushed hay with no rain which produced average daily gains of 1.51 pounds compared to 1.07 and 1.15 pounds gain for the rained-on hays.

The second heifer trial was designed to find which hays the heif-

ers chose when they were offered each type. The heifers (seven Guernseys, three Brown Swiss, and one Holstein) were about 13 months old. Six types of hay were offered free choice in mangers, and were rotated each day to avoid having the heifers associate mangers with types of hay.

It was interesting to watch the heifers eat. Even though they started at a number of the mangers, most of them finally ended up eating the crushed hay with no rain damage, first.

Hay Drying

A series of fine screens, 4 by 6 feet, were assembled on frames and set in the swaths and windrows. Hay was placed on these to the same depth as was in the field at cutting time. The frames could be weighed without disturbing the hay. Four trials were made during the two years and the data averaged. Data in both series showed that when the leaves of the uncrushed hay were dry enough to bale (about 17% moisture) the stems still had too much moisture (27 to 34%). By the time hay was baled, some drier leaves had fallen off (at less than 12% moisture). However, by the time crushed or conditioned hay was baled, leaf and stem moisture were nearly the same.

Chemical Composition of Hays

Many samples were taken for chemical analyses before baling and as the hays were fed. The average crude fiber was 3% less in the fan-dried, crushed hay (27% crude fiber) than in the field-dried hay (30%). This was because of more leaf loss in field-dried hays. Rain-damaged hays averaged 6% higher in fiber than those not rain damaged.

Protein content of the fan-dried crushed hay was 20%, dry basis, compared to 18% protein in the uncrushed field-cured hay.

Carotene content of the crushed, fan-dried hay with no rain damage was 20 micrograms per gram compared to 7.5 micrograms per gram in the field-dried, uncrushed hay. Little difference was found in carotene content at feeding time between crushed, field-cured and the crushed, fan-dried hay. The carotene in rained-on field-cured hay was almost gone, whereas carotene of the rained-on, crushed, fan-dried hay at feeding time still had 14 micrograms per gram at feeding time. Carotene is likely to be easily destroyed by exposure to weather. Therefore, any method which cuts down on weather damage usually means more carotene. Bleached hay usually has very little carotene.

Table 3. Preferences of Hays by Heifers

Rank	Hay description	Total pounds consumed
1	Crushed, fan-dried, no rain	450.0
2	Crushed, field dried, no rain	417.7
3	Crushed, fan-dried, rain	118.2
4	Crushed, fan-dried, no rain	83.9
5	Crushed, field-dried, rain	38.3
6	Uncrushed, field dried, rain	27.1

U. S. Grades

Hays were sampled and graded by the United States Official Hay Grading Service.

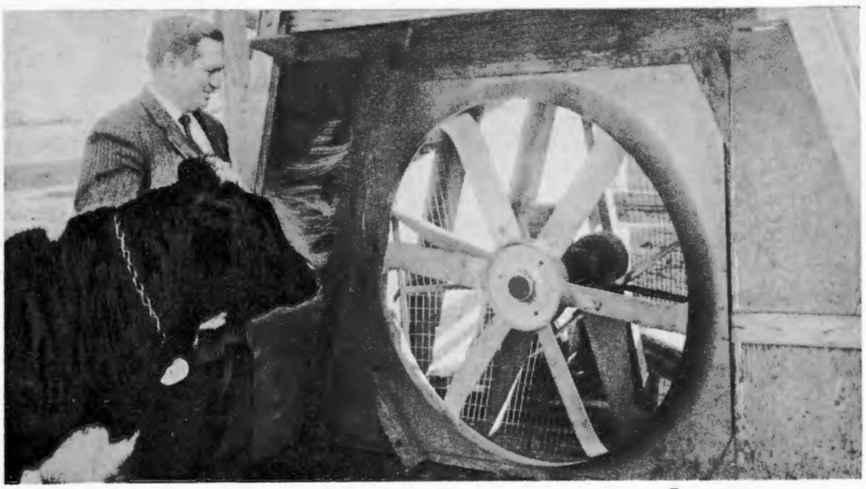
The conditioned, artifically dried hays graded U. S. No. 1 extra green, extra leafy, with a color rating of 80 to 90%, and a rating of 53% leaves. Some of the unconditioned hay rated U. S. No. 2 leafy alfalfa with a color of 58 to 65%, and 45% leaves. Some of the best of the unconditioned graded U. S. No. 1. The fan-dried hay had 50% or more leaves and 90% color rating.

Temperatures of the hay may have been a factor as the unconditioned bales reached 110 to 125 degrees F. The crushed hays did not exceed 83 degrees F. This is probably because the uncrushed hay stems were somewhat green as this hay was baled.

Practical Use of Conditioners and Driers

Some dairymen, especially those with high producing, registered cows, are using hay conditioners and/or driers. However, the use is limited because of cost. Also, the haying operation is slowed by conditioning and artificial drying. Mowing and conditioning time can be reduced, however, by use of side-mounted mowers which pull the power-take-off crushers behind. Based on the results of these trials,

Dr. Howard Voelker and one of the heifers used in the hay conditioning and drying trials study the fan used. Hay is stacked to the sides and top of frame and air is forced through.



the added cost of hay conditioning can be off-set in less than 3 years by increased milk production if a dairyman milks at least 30 high producing cows. If conditioned hay has 2% more protein on the average, the saving in protein supplements may pay for a conditioner in even less time.

Instead of mower-conditioning, however, many farmers are cutting their hay with small grain swathers, some with and some without conditioning attachments. These appear to save a great deal of labor and time and often the resulting hay appears to be of excellent quality.

State College to Manage Prairie Tract

An acreage of Altamont prairie in Deuel County, described as a "botanical museum," has been placed under the management of South Dakota State College, according to President H. M. Briggs.

The 62-acre tract was purchased by Nature Conservancy, a non-profit organization which maintains headquarters in Washington, D.C., and helps local citizens in many parts of the country to establish "natural areas" which will be kept free of both molestation and "improvement."

Clue to Original Species

What the uninformed citizen may regard as 62 acres of grass is enthusiatically seen by South Dakota State faculty members as a rare piece of ground —"an area indicative of the original prairies as the pioneer settlers first saw them," says D. J. Holden, head of the Botany Department at State and chairman of a newly-formed committee that will manage the area.

Located near Lake Alice, north and east of Clear Lake, the area will be used for research and educational purposes as well as a scenic spot.

Purchased at $47.50 per acre from Mr. and Mrs. John Pedersen, the area represents one of the first efforts in the nation by Nature Conservancy to aid an institution of higher learning to obtain a "natural area," or one in which uncontrolled nature accomplishes her own growing, changing wonders.

Creates Field Laboratory

"Interference by man brings the invasion of weeds as well as European-introduced grasses," explains Dr. Holden, who points out the acquisition in Deuel County is the hoped-for start of other "outdoor laboratories" in South Dakota for the use of students and teachers in all the state's colleges and universities.

Which means that as a scenic area the newly-acquired acreage will be open to the public—but there will be no camping, no fires, no promiscuous tramping.

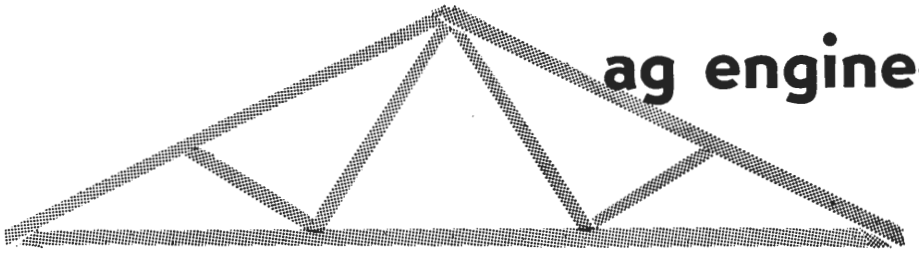
In this connection Dr. Holden explains that heavily-populated states no longer have such "natural" areas to preserve and are trying to re-establish them instead. He emphasizes that a tract which has been visited neither by plow nor grazing farm animals is a rare one.

Plot Nearly Undisturbed

The 62 acres in Deuel county, he adds, had been in the possession of the Pedersen family "many years" but to the best of anyone's knowledge had been "mowed only a few times."

Initial contact with Nature Conservancy in Washington was made by L. O. Fine, head of the Agronomy Department at State. Negotiations for purchase of the land were worked out through the help of the state representative of Nature Conservancy, B. E. Harrell of the Zoology Department at the University of South Dakota.

Dr. David J. Holden, head of the State College Botany Department, studies one of the many plant species found on the 62-acre Altamont Prairie near Clear Lake. The plot, an undisturbed "natural area," was purchased by the Nature Conservancy and will be managed by South Dakota State.



ag engineers test NAILED JOINTS FOR TRUSSED RAFTERS

by CHARLES N. HINKLE[1]

THE USE OF TRUSSED rafters has been increasing in recent years because of the greater flexibility and functional use of clear-span, post-free farm buildings designed for today's rapidly changing agriculture.

These trussed rafters, generally spaced 4 feet on center, use 2 x 6's or 2 x 8's for the rafter or top chord and 2 x 4's for the ties or bottom chord and web members. By placing these trusses 4 feet on center, 2 x 4's spaced about two feet on center can be used for the roof girts supporting galvanized steel or aluminum roofing sheets. These trusses at the same spacing can also support asphalt roofing products by using a solid decking of 1 x 8 tongue and groove boards or ⅝-inch plywood sheathing with intermediate clips.

Two Plans Available

The plans now available for trussed rafters at South Dakota State College in the Midwest Plan series consists of either glue-nail or split ring and bolt type joints. However, these two methods of making joints are not satisfactory for all conditions in South Dakota. For instance, the glue-nail procedure requires maintenance of 60-70°F temperatures during the time of glue curing. This limits their satisfactory manufacture to certain periods during the summer months unless a heated shop is available for their construction. Even during mid-summer when the average temperature is sufficiently high for proper curing, peak temperatures during the day are apt to decrease the pot life of the glue, thus making construction more difficult. The use of split rings and bolts for truss joints requires a special drilling tool to groove the members to receive the split rings. Also, this drilling should be done with a drill press so that right-angle drilling is guaranteed. Such equipment is often times lacking where it is desirable to build trusses.

There has been considerable interest during the past few years in South Dakota concerning the possibility of using only nails as fasteners to fabricate the joints in trusses. The use of nails does offer several advantages over the other two methods of joint construction. No special tools are required and anyone skilled with the use of a hammer and saw can build this type of truss. Nailed trusses can be used either immediately after completion or they can be stored in the open until needed so long as the wood does not deteriorate.

Thus, one phase of Agricultural Engineering Project No. 316, "Adaptations on New Construction Concepts to the Design of Farm Service Buildings and Animal Shelters," has involved the adapting of Midwest Plan No. 72027, a glue-nail truss, for use with nailed joints. The size, style, and material requirements of the truss remain the same as the original plan with only the size of gussets and type of connectors used being changed.

Testing of Trusses

To confirm the calculated designs, several 30-foot trusses were built and tested on the truss-testing machine in the Agricultural Engineering Department at South Dakota State College. Figure 1 is a general view of the truss-testing machine with one of the 30-foot trusses in place for testing.

Design of Machine

The basic frame of the truss-testing machine consists of two 15-inch channels, 50 feet long, placed back to back, with an 8-inch space between the two channels. Three-inch double acting hydraulic cylinders are mounted in the 8-inch space between the two channels. Pull rods connect the top clevis or moving portion of the hydraulic cylinder to the top chord of the truss.

The test table shown at the left of Figure 1 contains a motor driven hydraulic pump and pressure control and measuring devices. Pressure applied to the cylinders pulls downward on the top of the truss.

[1]*Associate professor, Agricultural Engineering Department*

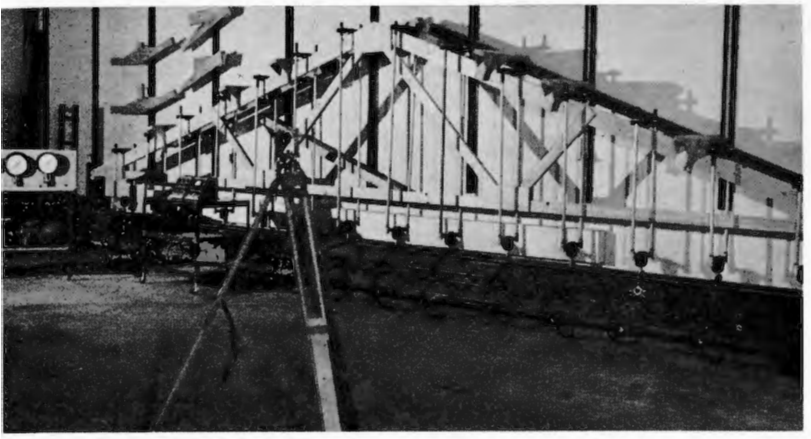


Figure 1. General view of the truss-making machine with one of the 30-foot trusses in place for testing.

This pressure is recorded from the pressure gauge at intervals when the pressure is equal in all cylinders and converted to load on the truss in pounds per foot.

The transit located in the foreground of figure 1 is sighted upon a scale attached to the ridge gusset. As the truss is loaded, the ridge deflects downward and this movement is recorded by readings through the transit. Thus, it is possible to determine the amount of settlement or deflection for the various loading conditions. The truss is prevented from moving sideways, but unrestricted vertically, by 2 x 4's attached to a rack along the wall acting similar to roof girts nailed to the top of the truss.

Testing Shows Weaknesses

Trusses were built according to the calculated designs and then tested. The performance of the truss on the truss-testing machine then indicated what changes should be made in order to make a stronger or possibly a stiffer truss. Minor changes in the gusset plates and nail patterns were made after the original tests were completed. Several additional trusses were then built and tested. This ability to test the trusses under actual loading conditions is a positive way of proving the worth of a truss design. Any weakness in the design becomes obvious, thus allowing corrections to be made before distribution of the final plans.

Five Trusses Tested

Five trusses were built at the start of this truss series. Three of these were nailed trusses, built according to calculated design, and two were glue-nail trusses built from Midwest Plan No. 72027. Each truss was tested in the following manner. First, the truss was loaded to full or design load, and the load was released; second the truss was loaded to one and a half times full load and the load released; and finally, the truss was loaded until failure. The load computed from the pressure gauges was recorded along with the deflection at the ridge joint throughout the tests.

Of the nail trusses, two were tested within several days of construction and the final one was tested after several months of storage. After the initial test, the gussets and nail patterns were redesigned slightly and two more trusses built and tested in a manner similar to that used initially.

The final truss was built and tested prior to the preparation of this report and utilized a more satisfactory cutting diagram for the plywood gussets.

Results

All the trusses which were tested were more than adequate for use in South Dakota with some performing better than others. The general results of the test are shown by the range graph of figure 3 (page 10). It can be seen from figure 3 that the stiffness or load versus deflection range of the glue-nail truss was slightly better than the range of the six nail trusses tested. However, the final nail truss design, presented in the plan, was the stiffest nail truss and equal in stiffness to the average glue-nail trusses to a point slightly beyond the design load.

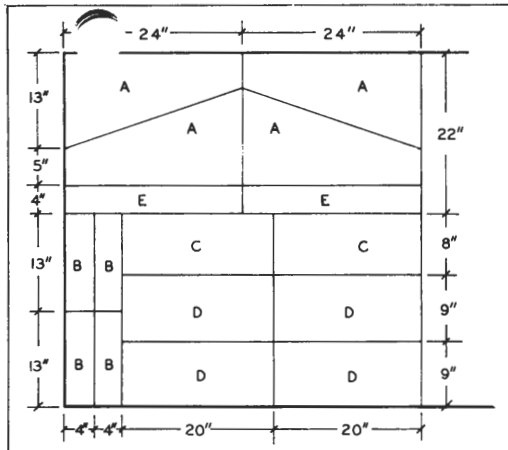
In South Dakota, a long time load of 20 pounds per square foot on the roof is used for design purposes. When the truss is tested, this load is applied during a relatively short time, about 15 minutes, and since wood is able to sustain a greater load for a short period of time than it can during an extended period of time, the design load should be multiplied by a factor of 1.5 to obtain an accurate test load value.

Thus, the 20 pounds per square foot design load amounts to 80 pounds per lineal foot on trusses spaced 4 feet apart, and would be equal to 1.5 times 80 or 120 pounds per square foot for a short time load. This is the design load marked on figure 3.

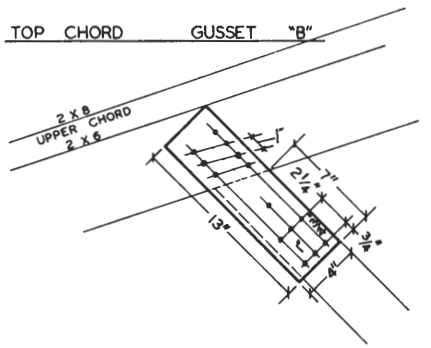
Deflection of the roof of a building is generally limited to no more than 1/240th of the span of the rafters or trusses. Thus a 30 foot span, such as tested in this series, would allow a total deflection of 1½ inches at the ridge joint under full load conditions. The deflection of 1/360th of the span, a commonly used deflection in dwelling construction, is marked on figure 3 instead of 1/240th of the span since the graph was not extended far enough to make such a mark. The average deflection of the glue-nail trusses and of the final design of the nail truss amounts to about 0.35 of an inch under design load conditions. This is about one-fourth of the allowable deflection. The safety factor was between 2 and 3 or 240 to 360 pounds per foot for these trusses, which is the desirable range for good design.

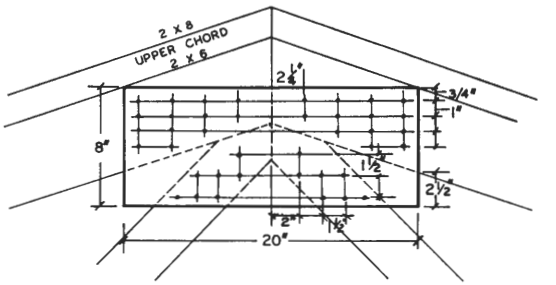
Conclusions

The final design (figure 2) presented as a plan is to be used in conjunction with Midwest Plan No. 72027.

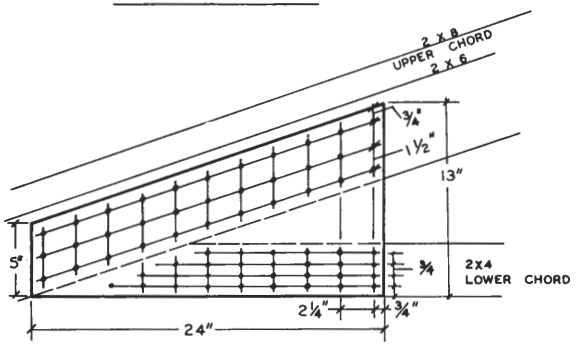


CUTTING DIAGRAM

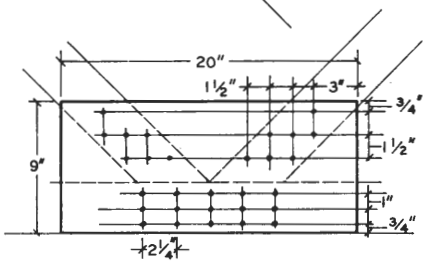




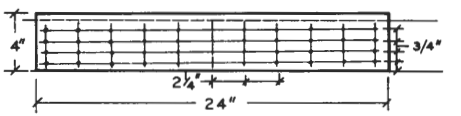
RIDGE GUSSET "C"



HEEL GUSSET "A"



BOTTOM CHORD GUSSET "D"



CENTER GUSSET "E"

NAILING SCHEDULE

Number and size of common nails per member in each joint for different spans.

Joint	Member	24 ft. span 8d nails	30 ft. span 8d nails	36 ft. span 8d nails	40 ft. span 10d nails
A	upper chord	22	27	33	33
	lower chord	21	25	30	30
B	upper chord	5	6	7	7
	short web	5	6	7	7
C	upper chord	10	12	13	13
	long web.	5	6	7	7
D	lower chord	11	13	15	15
	short web	5	6	7	7
	long web	5	6	7	7
E	lower chord	14	17	20	20

NOTES:

1. Obtain member sizes and plywood thickness from Midwest Plan No. 72027.
2. All notes on Midwest Plan No. 72027 with the exception of those refering to gluing procedure and handling are still applicable.
3. Minimum nail spacing is 2¼" along the grain and ¾" perpendicular to the grain of the members.
4. Nail spacing and number are critical and a template should be used to assure proper spacing and number of nails at each joint.
5. Approximately one-half of the nails required for each member at all joints should be driven from the front side of the truss; the truss is then turned over and the remaining nails driven from the rear.

NAILED GUSSETS FOR M. W. No. 72027
4' O.C. SPACING

SOUTH DAKOTA STATE COLLEGE
UNITED STATES DEPT. OF AGRICULTURE COOP.

designed by E. N. Kinkle — sheet 1 of 1
drawn by Paul Wuebben — no. 6213-01
date: 8-28-62 — scale: none

Figure 2. Final design presented as a plan to be used in conjunction with Midwest Plan 72027.

These trusses are designed for a four-foot on center spacing and for spans of 24, 30, 36, or 40 feet. As can be seen from the plan, the same gusset sizes are used for all trusses. The only change is in the thickness of the plywood used for the gussets, with ½-inch plywood being used for the 24-30- and 36-foot trusses and ⅝-inch plywood being used for the 40-foot trusses.

The nail pattern shown on the plans is for the 36- or 40-foot trusses using eight penny common nails for the 36-foot and ten penny common nails for the 40-foot truss. The number of nails required in each joint member for 24- and 30-foot trusses is reduced from the 36-foot pattern according to the nailing schedule shown. In general, the nailing schedule shown. In general, the nails omitted should be from the center of the nail groups. When nailing the trusses, about one-third to one-half of the nails should be driven from the back side of the truss. This involves turning the truss over, but it is no longer necessary to keep it in the form since joints are already partially completed due to the nails from the front side of the truss.

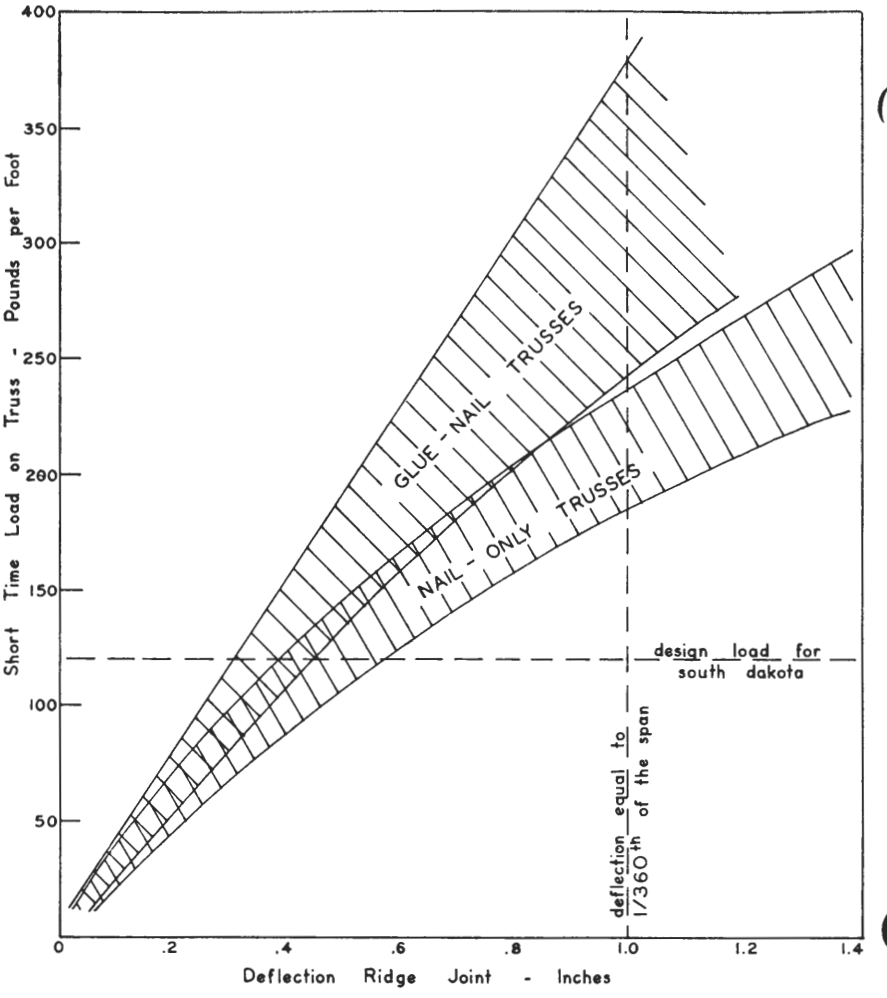


Figure 3. Range graph showing the effects of short time load upon the deflection at the ridge joint.

The number and location of nails is critical in most of the joints, especially the heel joints and lower cord splice joints. Deviation from the nail pattern indicated might result in seriously weakened trusses. Nail spacing in the main members should be no closer than 2¼ inches parallel to the grain of the lumber and no more than ¾ of an inch perpendicular to the grain of the lumber. The main members should be cut so that knots or other defects will not affect the nail patterns.

The location of the nails on the plywood gussets can be easily marked by use of a template. A template can be made by cutting the full size gussets from a piece of cardboard. The nail locations should then be carefully marked on the cardboard and about ⅜-inch holes punched at the nail locations. These cardboard templates are placed over the gussets and a can of spray paint is used to mark the hole locations. About ⅓ to ½ of the holes should be covered with a piece of masking tape when making the face side gussets. The back side gussets are then made by using masking tape over the holes which were not masked out during the making of the face side gussets. Special attention needs to be given to the heel gussets and the gusset connecting the short web member to the rafters since there are right and left hand gussets at these points.

The proper use of the plan presented should make it possible for everyone desiring to use trusses to have the opportunity to do so. For those desiring trusses with spans differing from the 24-30-36- and 40-foot spans indicated by this plan series, one would use the gusset and nail requirements for the next larger truss. Thus, for a span of 34 feet, the gussets and nail requirements for the 36-foot truss would be used with the length of the members reduced accordingly.

1962 Eminent Farmers, Homemakers Honored

FOUR RURAL South Dakotans were recognized as Eminent Farmers and Homemakers this fall at South Dakota State College.

Mrs. Matthew Evans, Ipswich, and Mrs. Otto Laue, Custer, were honored as Eminent Homemakers. Percy Wallace, Britton, and Albert Keffeler, Sturgis, are the Eminent Farmers.

The 34th annual recognition day followed the theme "Today's Challenges," and was made up of three parts. During the forenoon the new honorees and many of over 130 people selected for the award in past years held the Farmers and Homemakers Association annual meeting. During an afternoon program, Dr. Max Myers, professor of Economics, spoke on "Today's Challenges and Agriculture."

The evening banquet program featured the Reverend Robert Borgwardt, pastor of the First Lutheran Church, Sioux Falls. He spoke on "Living With Today's Challenges."

Mrs. Matthew Evans

Mr. and Mrs. Evans sold their 480 acre farm in Powell Township in the spring of 1961 and moved to Ipswich, where they are now semi-retired. Mrs. Evans has been active in community development and worked as a 4-H leader for 10 years. She encouraged her four children, Marion, Mavis, Myrna, and Moris, to participate in 4-H activities.

She served as Edmunds county Cancer Society chairman for 5 years, is past Noble Grand of the local Rebekah Lodge, and has been secretary of the cemetary association since 1951. In 1953 and 1955, she and Mr. Evans were host parents to International Farm Youth Exchange delegates.

Mrs. Otto Laue

Mrs. Laue lives on the family ranch near Custer with her husband and son Herman. A school teacher before her marriage, she has also been an active community worker. She was recently honored with a silver platter for 25 years of work with the Lutheran Sunday School in Custer, and has been a steady worker in other church activities. Mrs. Laue helped organize the local 4-H club, to which Herman, and her other sons, Richard and Ernest, belonged.

She also worked with the local Red Cross Organization, was a polio drive volunteer, and although slowed down somewhat by a heart condition in recent years, has continued to be an active housewife.

Percy Wallace

Percy Wallace still lives on the farmstead which has been under Wallace supervision since 1883. The diversified farm now consists of six quarters of farm land, as well as 2,000 hens and 120 ewes.Wallace is a charter member of the Marshall County Soil Conservation District, and was an active supervisor of that organization until his health forced him to retire about 2 years ago.

He is also a charter member of the county Crop Improvement Association Board, and was recently awarded by the association with the only plaque ever given in Marshall county for such long service. He was active in getting rural electricity into the area, was named Honorary Farmer of the Year by the Britton Future Farmers of America chapter, and is an elder of the Presbyterian Church.

Albert Keffeler

Albert Keffeler, the oldest of 13, children, rented the 480 acre family ranch in 1921, and is now president of the 9000 acre Keffeler Hereford Ranch, Inc. The Keffeler's main operations are wheat and purebred Hereford cattle.

Keffeler was recently appointed by Governor Gubbrud to the 8-member South Dakota Welfare Commission. And over the years he has been active in many other organizations including the County Crop Improvement Association, of which he is now president; the Meade County Stock Growers, the Farm Bureau and Farmers Union, the South Dakota Performance Records Association (president in 1961), the Sturgis Chamber of Commerce, the Board of Directors of the community hospital, and the local school board.

Pictured at the annual eminent farmer and homemaker recognition day were Dean of Agriculture Orville G. Bentley, Albert Keffeler, Mrs. Matthews Evans, Percy Wallace, and South Dakota State College President H. M. Briggs. Mrs. Otto Laue was unable to attend because of a broken ankle.

To change a culture

A sociologist looks at factors—socialization, social change, and social disorganization—which have led to a conflict in values on the Pine Ridge Indian Reservation.

A SEDATE DAKOTA GRANDMOTHER shepherded her miniature grandson up the dry wood-slab steps and across the creaking boards of the aged porch to the door of the trading post in the remote village of Kyle, South Dakota, on the Pine Ridge Indian Reservation. As she towed her toddling warrior through the unscreened entranceway, his attention was attracted to the fascinating display of glass jars, half-filled with multishaped colored candies. Tugging at his grandmother's [illegible] dark skirt, the youngster [illegible] with her for some of the sweets. Without the slightest expression on her careworn face, the old woman searched for her tiny black purse and dug for a few pennies. After she had purchased the candy for her grandson and finished her shopping, the contented pair departed. As they walked down the gravel road toward their log hut several miles south of the store, the confused storekeeper muttered to himself, "I just can't see how they can spoil their kids like that. All they have to do is ask for something and they get it."

An aged Dakota patriarch, sitting in the corner of the store with a few other old timers, puzzled quietly to them: "We know that if we don't take care of our buffalo meat, it will spoil—but how can much love make this boy rotten?"

The underlying meaning of this seemingly insignificant playlet must be sought in the inter-mingling of of the old and new ways of life on the reservation. The anecdote encompasses three phases of cultural life which can be described for the

By VERNON D. MALAN
Professor, Rural Sociology Department

typical reservation community in South Dakota:

Socialization—The learning of attitudes and values during early childhood shapes the individual's behavior, and in the Dakota Indian traditional culture the teachings of parents and other kinsmen and the internalization of the cultural heritage were fused together in the socialization process. The grandmother was permissive, and affectionate toward her grandchildren; she loved their company and respected their wishes. And she played a significant role in their socialization. The relationship between the grandmother and grandson was misinterpreted by the storekeeper, and his experiences in non-Indian society caused him to evaluate her behavior as "spoiling the child."

Social change — The transition from preliterate to modern society proceeds unevenly in the reservation community. Differences between individuals are arrayed in various stages of assimilation from those who remain bound to isolated folk groups to those who have accepted the ways of the non-reservation mass society. While the rate of change may be slower, the range of change is greater, and there is more evidence of group factionalism and interpersonal conflict when the differences are exaggerated by the assimilation process.

The storekeeper represents the modern orientation and is impatient of the grandmother who clings to the ways of the past. The old woman, sensing the ethical vacuum in which a "lost generation" of young people is growing up on the reservation, represents the traditional orientation, and she is trying to conserve something of the moral values of her people in her grandson.

Social disorganization—The destruction of traditional values and ways of living among the Dakota Indians was not compensated by the gift of any ethical system which might have provided meaning for the Dakota people when they were forced to accept the pattern of reservation living. The changes which were introduced among them in their new setting had no ideological foundation. They created a chaotic condition in which the old norms which controlled behavior—the folkways and the mores—could no longer function effectively. The new norms—the rules and regulations imposed by the government—were unacceptable and could only be enforced by coercion. The result was a condition of normlessness or "anomie" in which, for the Dakota warrior, there was no safe standard for measuring the quality of his behavior.

Understanding Difficult

The virtual void of visionary values among those who are in transition between the traditional and modern cultures causes the old timers to puzzle vainly at the inconsistencies in their children's behavior. The beliefs which they held in basic principles and which were rational because they were based on the hard and long test of experience apparently did not apply in the changed reservation situation. If things must be cared for to prevent their spoiling, "how can much love make this boy rotten?"

Research Suggests Changes

The mystery of social life on the South Dakota Indian Reservation may be at least partially solved by examining a series of research findings in the three broad areas previously outlined. While the "final answer to the Indian problem" must await the intervention of political mysticism, some pertinent insights into the way of life on the reservation may suggest policy changes which serve to ease the transition from traditional to modern ways of thinking for the Indian people. In the acculturation process it may even be possible that our society could benefit by learning and adapting some of the best traditions of the Dakota Indian people, just as it is assumed that they will benefit from acceptance of the best modern American society.

Socialization

The family in traditional Dakota Indian society was extended to include the whole camp circle, and this larger kinship group was the setting in which the growing child learned the expected behavior patterns.[1] The system of kinship was the molding force which bound their economic, social, and religious values into a meaningful unity. It provided a relatively rigid system of ascribed statuses and roles which dominated the very close and elaborate personal relationships between members of the kinship group. If there was one area of Dakota culture which was resistant to the persistent changes

[1]The findings summarized in this and the following paragraphs are presented in more detailed form in *The Dakota Indian Family*, Vernon D. Malan, South Dakota Experiment Station Bulletin No. 470, South Dakota State College, Brookings, S.D.

In the past, Indian children, to preserve traditional tribe character, tended to avoid the educational programs set up by the government. Although most now attend regularly, they have the satisfaction of being able to return to the warm and friendly family groups if they decide they do not like school.

introduced on the reservation, it was this family system.

Guided by Elders

Socialization within the kinship system rested fundamentally upon the learning of the expected patterns of behavior, and as long as the individual was satisfied with the strong sense of solidarity provided by the kinship group, he accepted the teachings of his elders without question. The guidance of the older generation, and especially of the venerated grandparent, was permissive, wise, and effective. They possessed the qualities and experience of leadership which caused the younger members of the group to follow them without coercion and with great loyalty.

Deeds Determined Leaders

The model of ideal behavior was discovered by the young people in the person of the honored warrior whose deeds of valor were many and unquestioned. His leadership was not exemplified by any formal office or any aggressive display of power to influence his contemporaries. On the contrary, he was a leader by virtue of the respect shown him by those who willingly followed his example. To achieve his leadership role, he had served the other members of his kinship group, helping the needy through his generosity, abiding strictly by the spirit of his verbal promises, honoring others by praising them, and never offending the dignity of even the smallest and most insignificant child. Here was indeed a man whose behavior was imitated by those who sought him out for advice and assistance, and whose personal qualities inspired confidence in the younger generation as they approached adulthood.

The influence of the kinship system in the socialization of the Dakota Indian child was illustrated by the attitudes of complaint, almost ingratiating, apathy which frustrated early educational efforts on the reservation.

In order to preserve their traditional character they simply avoided the whole educational process with the tacit approval of their parents. They had a generalized model in the kinship group of passively resisting adults to imitate. They were keen observers of their parents and soon realized that the expected attitudes toward government education was overt conformity, but covert retention of family patterns and values. If educators attempted coercion, they were able to escape by running away to the warm and friendly welcome of their family groups.

How They Learned

What was learned by Dakota children in the socialization process may have been as important as how the learning came about. The content of the process differed sharply from the ethical system which is referred to as the "American way of life." They did not, for example, learn time oriented values which require continuous, regular, and punctual work habits, the budgeting of income to satisfy future needs, and the planning for events in a definite time sequence. The value orientation engendered in the child was a harmonious relationship with the natural world in which they lived and thus they learned that like nature, time was generally endless, unlimited, and eternal. Basic differences in thinking were, therefore, instilled through the socialization process into all the areas of their socio-cultural life.[2]

Social Change

In the long term view, if individuals modify their behavior, however gradually, changes in the culture will eventually be effected. The observable shift from traditional Dakota values to the modern values of Western Civilization has been relatively slow for these and other reasons: (1) socialization tended to skip a generation—from grandparent to grandchild; (2) preservation of the mythical time perspective made changes superficial; and (3) assimilation of material traits was much more rapid than the acceptance of the social attitudes and values of the dominant society.[3] Nevertheless, basic changes in the value orientation of Dakota culture have taken place.

Way of Life Will Change

Not only has modification of the socialization process occurred in family groups, but by increased participation in the larger society, as well as identification with Pan-Indianism and the diffusion of modern technology, the Dakotas have been undergoing a series of phases in their cultural change which will entirely transform their way of life. Although most of their older values are still functional, the values of Western Civilization are actually accepted with more concensus on the reservation today than is the case for traditional Da-

The majority of Indian family heads still do not possess adequate housing, education, or economic assistance to make ranching a successful enterprise.

[2]Vernon D. Malan and Clyde McCone, "Time Concept, Perspective, and Premise in the Socio-cultural Order of the Dakota Indians," *Plains Anthropologist* V (May 1960), pp. 12-15.

[3]Vernon D. Malan and Martin Kallich, "A Changing Dakota Indian Culture", *South Dakota Farm and Home Research*, VIII (May 1957), pp. 11-15.

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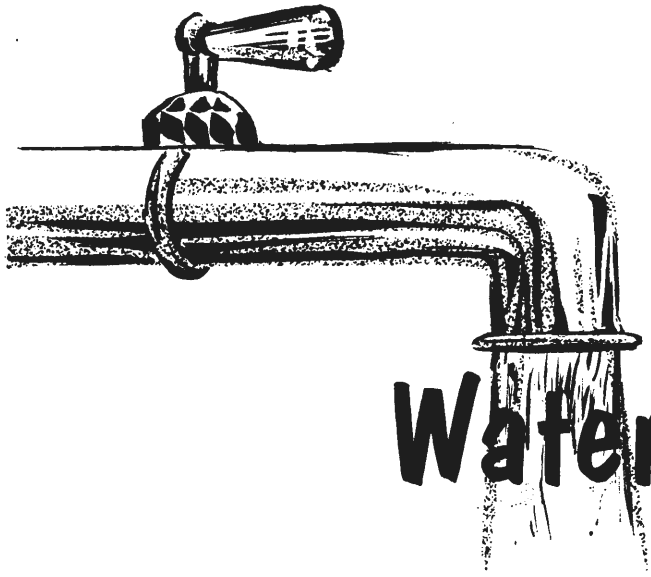
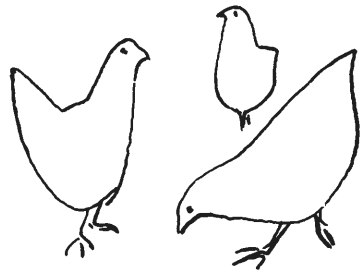




Water For Poultry

the effects of saline water on South Dakota chickens, ducks, and turkeys

by L. M. KRISTA, C. W. CARLSON, and O. E. OLSON[1]

FOR MANY YEARS it has been known that some South Dakota ground waters are unsuitable for livestock because of their high content of dissolved minerals. Many people confuse this high mineral content with alkalinity. Actually, few waters in the state are excessively alkaline, from the standpoint of use for livestock. In general, when the term "alkali" water is used, the correct term would be " saline," or salty.

Losses Due to Salt

Many livestock losses have been traced to the use of high mineral (saline) waters. To avoid such losses, South Dakota farmers and ranchers can have analyses made of supected water supplies and get an evaluation of their suitability for animals.

The analysis, while requiring skill and special equipment, is much less of a problem than is its interpretation. When is a water safe to use for livestock or poultry? At what level of dissolved minerals does is become unsafe? No simple answers exist. Species vary in their susceptibility to injury by saline waters. Time of the year also has some effect, since water intake is higher during hot weather. If more than one source of water is available, this must be considered. The age of an animal is also important, as are kinds of minerals present, and mineral content of feeds. These and other matters make a simple recommendation difficult.

In spite of the problems involved, experimental work at this and other experiment stations has been of great assistance in interpreting the results of water analysis and in designing recommendations. Work with rats, cattle, and swine, as well as limited work with poultry, was reported in South Dakota Agricultural Experiment Station Bulletin 481. The recommendations in that bulletin are for cattle, sheep, horses, and swine. Poultry recommendations are presented here.

How the Work Was Done

Experiments were run using young chicks, laying hens, turkey poults, and ducklings. Waters of varying salinity were prepared by adding different amounts of the appropriate salt to Brookings tap water. While some work was done using magnesium sulfate (Epsom salt) and sodium sulfate (Glauber's salt), most experiments were run using sodium chloride (common salt), since experience has shown it to be particularly troublesome in poultry. All salts used are commonly found in South Dakota waters. Effects on mortality, growth, feed consumption, and feces condition and various physiological symptoms of toxicity were observed in the several experiments.

Results

Experimental results are summarized in table 2. The lowest level of sodium chloride used was 4000 parts per million (p.p.m.), or 0.4%. This level had some adverse effects in all cases. At higher levels the adverse effects increased in severity.

Only limited work was done with sodium sulfate and magnesium sulfate. These salts seemed less toxic than sodium chloride. However, further work must be done to establish this observation.

Conclusions

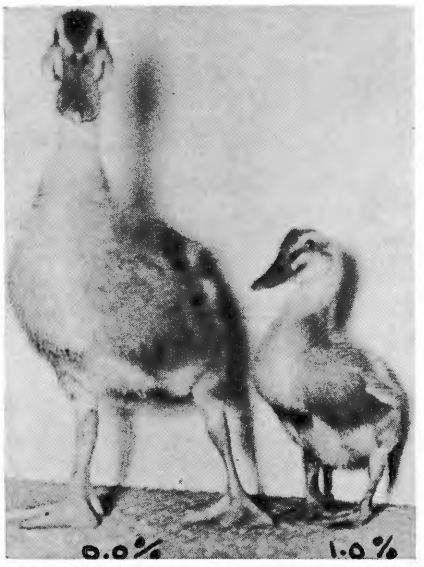
The several experiments showed some difference between species and also an age effect on the susceptibility of poultry to the effects of saline water. How-

[1]*Graduate assistant and Professor, Poultry Science Department, respectively, and Professor, Biochemistry Department.*

[2]The work with poultry is presented in detail in Poultry Science, Volume XL, pages 938-944, 1931, and is therefore only summarized here.

Table 1. Effects of Salt Content of Poultry Drinking Water, Based on Conductivity Tests

Conductivity (micromhos/cm)	Evaluation
0 to 999	Excellent for all poultry.
1,000 to 2,999	Satisfactory for all poultry. At the higher levels within this classification watery feces may occur, but there should be no increased mortality nor any decrease in production or growth.
3,000 to 4,500	This is a poor water for poultry. It will often cause watery feces, and it may cause increased mortality and decreased growth, especially in turkey poults.
Over 4,500	This water is considered unfit for poultry. It will almost always cause some type of problem, and the probability that it will reduce growth or production, increase mortality, or cause other symptoms of toxicity is fairly high and increases with increasing conductivity.



Effect of addition of salt to Brookings tap water on growth of ducklings.

Table 2. The Effect of Sodium Chloride Content of Drinking Water on Poultry

Sodium chloride content (p.p.m.)	Chicks	Laying hens	Turkey poults	Ducklings
4,000	Watery feces. Some loss of appetite. Some increase in water consumption.	Watery feces.	Watery feces. Some loss of appetite. Some increase in water consumption. Some inactivity and somnolence. Some decrease in growth. Slightly increased mortality.	Watery feces. Some increase in billing of feed. Some decrease in growth.
7,000	Watery feces. Decreased growth and appetite. Increased mortality. Increased water consumption. Some inactivity.	Watery feces. Increased water consumption.	Watery feces. Decreased growth and appetite. Increased mortality. Increased water consumption. Some inactivity and somnolence.	Watery feces. Some increase in billing of feed. Decreased growth and appetite.
10,000	Watery feces. Greatly decreased growth and appetite. Greatly increased mortality. Billing of feed. Several other symptoms of toxicity, such as dehydration, labored breathing and edema.	Watery feces. Decreased egg production. Greatly increased water consumption.	High mortality (all dead at two weeks).	Watery feces. Billing of feed. Loss of appetite and reduced growth. Some inactivity. Increased mortality.

ever, the data allow for some generalization, and it does not seem necessary to devise a separate set of recommendations for different species and different age groups. Neither does it seem necessary to consider the major salts in water separately. Rather, the total salts content, quickly estimatable by measuring the water's conductivity, appears most useful in evaluating its suitability for poultry.

In these experiments, the lowest level of sodium chloride used caused some trouble. *Therefore, any water with 4000 p.p.m. of salts should be classed as unfit for poultry, since in turkey poults it actually increased mortality.* Because there is room for some judgment here, and in view of the fact that a gradual transition from toxic to a non-toxic water occures, it is impossible to set definite limits. The other factors mentioned earlier (salt content of the ration, season of the year, etc.) add to the difficulty. The rec-

ommendations in table 1 are estimates based on the experimental work and other observations, and include a reasonable margin of safety. They must be used with some discretion.

Recommendations

The most rapid method of determining the total soluble salts content of a water is to measure its conductivity. As it is usually reported, conductivity is a little higher than the salts content in parts per million. The following table of recommendations is based on conductivity. If only the soluble salts content is known, this value in parts per million can be substituted for conductivity without causing great disparity in the resulting evaluation.

Norgaard Receives International ICIA Award

ACHIEVEMENTS IN CROP improvement work recently won for U. J. Norgaard, a long time State College staff member, the distinguished service award from the International Crop Improvement Association during the organizations's 44th annual meeting in Hershey, Pa.

Mr. Norgaard was cited with honorary membership in the international association.

He was selected because of his outstanding accomplishments in crop improvement which include: his ability to motivate people to to use better seed and adopt better crop production methods, for reorganizing and activating the South Dakota crop improvement association and promoting its acceptance throughout the state of South Dakota, and for planning and drafting legislation in South Dakota to create and establish a State Weed Board in order to bring about one of the best weed control programs in the United States.

South Dakota Leader

He also developed the annual South Dakota Crop Show to stimulate a state wide crop improvement program, he developed the South Dakota Foundation seed program, and helped to draft the present seed certification on laws and the State Weed Certification Board, which gave South Dakota seed certification a legal status.

Norgaard served as chairman of the small grain committee for several years and has been an active member of the following committees of ISIA: legislation and by-laws, international grain and hay show, sorghum, alfalfa, trefoil, flax, and tree seed commodities, and special blue grass seed.

A University of Wisconsin graduate, class of 1920, he taught school 5 years in Wisconsin and South Dakota. He joined the South Dakota Agriculture Extension Service staff in 1926, retiring from South Dakota State in 1960 with an Emeritus rating.

U. J. Norgaard, left, retired Extension agronomist at South Dakota State College, received honorary membership in the International Crop Improvement Association during the organization's 44th annual meeting at Hershey, Pa. Presenting the certificate is awards chairman Arthur W. Young, of Texas Technological College, Lubbock. Others shown are Mrs. Norgaard and W. Leslie Shannon of Ottawa, Canada, president.

Irrigated Pastures on the Belle Fourche Project

by N. A. Dimick, J. A. Minyard, and L. F. Bush[2]

Irrigated pastures can be an important part of the livestock enterprise on a farm or ranch.

Livestock operators in and near the Belle Fourche Irrigation Project usually summer part of their livestock on nearby dryland ranges. They rely on irrigated lands for the production of winter feeds. Below-average rainfall often necessitates a short grazing season and a longer period of supplemental feeding of hay and forages produced on the irrigation project. Livestock management programs such as this emphasize the importance of high-yielding hay crops and the need for supplemental pastures.

Procedure

Research was initiated at the Newell Irrigation and Dryland Field Station in 1950 to evaluate livestock production on irrigated pastures. Some factors that influence total production are carrying capacity and length of grazing period for cattle and sheep.

Seven plots from seven to nine acres in size were used for this study. These plots were located on heavy clay soils. The land was class IV, with undeveloped topography and water distribution system. No attempt was made to arrange the plots topographically for better distribution of water. They were managed as a seven-unit pasture-crop rotation. Three units were used for pasture and four were planted to feed crops of small grain, corn, small grain as a nurse crop for alfalfa brome, and hay. The crops produced were utilized as feed for wintering and feeding livestock while they were not on pasture. The pastures were divided by a temporary fence—one half of each was used for sheep and the other half for cattle.

The management of the irrigated pastures was somewhat different than that of dryland ranges. Hay was generally removed from at least one of the pasture units in the spring. This was necessary so that the pasture cycle could be properly initiated. The hay was removed from the youngest pasture at about the time the livestock were placed on the plots.

"Wild-Flooding" Used

The wild-flooding system of applying irrigation water was used. Several methods of water management are adaptable to pasture irrigation. However, the wild-flooding system was chosen because one of the objectives was to evaluate the production potential from irrigated pastures using water management systems common to the area.

Ewes and lambs from the Station's Corriedale sheep flock were used for this study. Steer calves were purchased in the fall, wintered on a high roughage ration, and utilized during the following summer in the irrigation pasture program. The livestock were placed on the pastures about May 25, and remained there until about September 20, each year. Irrigation water was not normally available on the Belle Fourche Project until about June 15. Therefore, growth of forage in the spring depended

[2]*Agricultural Engineer, USDA, and assistant and associate professors, respectively, Animal Science Department*

on moisture from fall irrigation and precipitation received during the winter and spring months. The livestock were always on the pastures before the first irrigation. They remained on a particular plot about 14 days. This allowed a rest period of 4 weeks, giving the pasture an opportunity to recover before the next grazing period. Irrigation water was applied soon after the livestock were removed.

The animals were weighed at the beginning and end of each grazing season and periodically throughout the summer. Seasonal and average daily gains for each class of livestock and carrying capacity of the pastures were computed. Length of the grazing period, forage yields, and livestock and irrigation management data were taken to further evaluate the performance of these irrigated pastures.

Results

Seasonal production, length of grazing period, and carrying capacity for sheep and beef cattle are shown in tables 1 and 2. The average grazing period was 117 and 115 days for sheep and beef cattle, respectively. The irrigated pastures provide good to excellent grazing for about 4 months. The pasture provided green-chop feed for the cattle an average of 98 days each year. The carrying capacity is given an animal unit months (AUM) per acre, one animal unit for a period of 30 pasture days. For this purpose five ewes, ten lambs, or one and one-half yearling heifers or steers are considered one animal unit. For example, 100 ewes grazing a 10-acre pasture for four months would represent eight animal unit months and is calculated as follows: Animal unit months = number months (4) x animal units (100/5) ÷ number acres (10) = 8.

Sheep Average 290 lbs./a.

Sheep gains on the irrigated pastures averaged 258 pounds per acre for the period 1952 through 1956, and 331 pounds from 1957 through 1959. Production for the nine-year period averaged 290 pounds per acre with a maximum of 363 and a minimum of 210. The carrying capacity for sheep ranged from 4.59 to 6.91 AUM per acre with an average of 5.55. Irrigated pastures, managed as these were, would carry from 5 to 8 ewes per acre during the grazing season. The average would be 7.2 ewes per acre. Five ewes and their lambs appear to be the optimum number per acre for irrigated alfalfa-brome pastures under these conditions.

Beef cattle utilized the forage in two ways, grazing from 1952 through 1956 and feeding green-chop from 1957 through 1959. During the years grazed, gains varied from 200 to 333 pounds per acre with an average of 285. When the forage was green-chop fed, seasonal gains varied from 301 to 394 pounds per acre with an average of 351. The differences observed may be attributed to pasture condition, weather, or management of the livestock and irrigation water. The carrying capacity for beef cattle ranged from 3.65 to 4.75 AUM per acre with an average of 4.09 while grazing the pastures and 4.41 to 6.55 AUM per acre with an average of 5.20 when green-chop fed. The data indicate that approximately 1.69 yearlings per acre could be carried on the pastures for the grazing season, whereas 2.39 yearlings per acre could be green-chop fed.

Beef cattle produced more meat per acre than did sheep. Beef cattle gains from 1952 through 1956 (all animals grazed) averaged 285 pounds per acre compared to 258 for sheep. From 1957 through 1959 (beef cattle green-chop fed, sheep grazed) gains averaged 351 and 331 pounds per acre for beef cattle and sheep, respectively. The differences observed are probably due largely to the classes of livestock used in this study. Only young, growing beef animals were used, but the sheep were mature ewes with their lambs.

Maggot Control

The most difficult problem with sheep was the control of maggots. Extreme care was necessary to ensure adequate tagging during July and August. Very little difficulty was encountered with bloat while pasturing sheep. Most sheep losses

Table 1. Sheep Production from Irrigated Alfalfa-Brome Pastures, Newell, South Dakota, 1952-1960

Year	Length of grazing season	Ewes				Lambs				Ewes and lambs	
		Animal days	Total gain	Average daily gain	Gain per acre	Animal days	Total gain	Average daily gain	Gain per acre	Gain per acre	Carrying capacity
	days		lb.	lb.	lb.	lb.	lb.	lb.	lb.	lb.	AAUM acre*
1952	124	3,730	447	.12	55	3,774	1,405	.37	172	227	4.59
1953	108	3,574	167	.05	20	5,116	1,549	.30	190	210	5.01
1954	127	8,509	1,009	.12	85	7,633	2,516	.33	211	296	6.91
1955	111	5,439	127	.02	11	7,031	2,555	.36	229	240	5.35
1956	97	4,559	419	.09	43	6,816	2,651	.39	273	316	5.46
1957	118	7,196	615	.09	60	5,851	2,253	.39	219	278	6.54
1958†	125	4,030	–290	–.07	–30	8,635	3,709	.43	378	349	5.68
1959†	119	3,864	69	.02	6	11,159	4,060	.36	327	333	5.08
1960†	120	3,010	214	.07	22	9,239	3,277	.35	341	363	5.29
Average	117	4,879	309	.06	30	7,250	2,664	.37	260	290	5.55

*Animal unit months. One animal unit for a period of one month. Five ewes or 10 lambs are considered one animal unit.
†Lambs were weaned about August 1, they remained on pasture and ewes were removed during these three years.

during the period were unrelated to experimental treatment. Bloat remained one of the major problems in the utilization of irrigated grass-legume pastures by beef cattle. Death ranged from no loss in 1958 to 20% in 1956 with an average of 7.5%.

Summary

Research at the Newell Field Station from 1952 through 1960 indicates that as much as 360 pounds per acre of lamb or beef can be produced annually on irrigated pastures. These pastures were grazed for about 4 months.

Seven experimental plots were used in a pasture-crop rotation. Each plot was in pasture 3 years, corn 1 year, small grain 1 year, nurse crop and reseeding 1 year, and hay 1 year.

The wild-flooding system of applying irrigation water was used. Livestock were pastured from May 25 to about September 20. They remained on a particular plot about 14 days, allowing a rest period of 4 weeks. Each plot was grazed three times during the season. Irrigation water was applied immediately after the livestock were removed. When water was available another application was made before the livestock were returned.

Sheep were grazed each year of the experiment. Beef cattle were grazed the first 5 years and green-chop fed for 3 years. Only sheep were used during the final year of the study.

Carrying capacity of the irrigated pastures averaged 5.55 animal unit months (AUM) per acre for sheep, 4.09 for yearlings grazed and 5.20 for yearlings green-chop fed. The average grazing period was 116 days. The cattle were green-chop fed for an average of 98 days.

Annual production during the period when both were grazed averaged 285 and 258 per acre for cattle and sheep, respectively. During the 3 years that beef cattle were green-chop fed, gains averaged 351 pounds per acre. Sheep gains during the same period averaged 331 pounds per acre. Sheep production for the 9-year period averaged 290 pounds per acre annually.

Table 2. Beef Production from Irrigated Alfalfa-Brome Pastures, Newell, South Dakota, 1952-1959

Year	Length of grazing season	Animal days	Total gain	Average daily gain	Gain per acre	Carrying capacity
	days		lb.	lb.	lb.	AUM/acre*
1952	124	1,262	2,140	1.70	278	3.65
1953	108	1,275	2,560	2.01	333	3.68
1954	127	2,444	3,645	1.49	319	4.75
1955	111	1,975	3,295	1.67	295	3.93
1956	107	2,055	2,060	1.00	200	4.43
1957†	118	2,867	3,825	1.33	394	6.55
1958†	100	2,152	3,270	1.52	301	4.41
1959†	77	2,000	3,435	1.72	357	4.62
Av. 1952-56	115	1,802	2,740	1.52	285	4.09
Av. 1957-59	98	2,340	3,510	1.50	351	5.20
Overall av.	109	2,004	3,029	1.51	310	4.50

*Animal unit months, one and one-half yearling steers equals one animal unit.
†Beef cattle were green-chop fed forage during these years.

Recommendations

From this study the following recommendations are made for utilizing irrigated pastures in a livestock program.

1. Use a balanced rotation cycle of feed crops and pasture. The basic plan used in this study could be altered to fit almost any farming operation.
2. Four pastures of nearly equal size would be desirable. Increasing the number of pastures and removing the first crop from the youngest pasture for hay would improve the rotation system and provide a better start for the young pastures.
3. The pasture cycles should follow the general haying pattern of the area.
4. Livestock numbers should be governed to approach maximum utilization of the forage when it is growing vigorously.
5. Proper management of the irrigation water is essential for maximum production. Utilization of the forage at the right time will allow proper timing of irrigation. Irrigation water should be applied immediately after the live stock are removed. If the water is available and there is need for it, another application may be made before the livestock are again placed on the pastures. This application of water must be made in time for the soil to become firm on the surface before the livestock are returned. Water should never be applied while the livestock are on the pastures.
6. Close observation of the livestock is necessary to prevent loss from sickness, bloat or pests. Large numbers of animals in a relatively small area will allow frequent observations.

This study terminated at the end of the 1960 growing season. A new pasture research program is planned to study the practicability of land development for irrigated pastures, forage species most adaptable to irrigated pastures, and the influence of livestock and water management on production.

SEE PREVIEW OF WINTER EVENTS ON BACK COVER

To Change a Culture (continued from page 14)

kota values. Furthermore, investigation of reservation value systems revealed that:

> Reactions . . . vary for each individual from stubborn maintenance of traditional values to rejection of all Dakota values and full acceptance of non-Indian values. The assumption of positions at either extreme may provide a relatively stable personality adjustment. But the individual who vacillates between the two value systems is likely to search for some sources of meaning in group-approved and recognition-giving activities, such as are available in marginal religions.[4]

Studied Those in College

Additional evidence of the changing attitudes of the younger generations of better educated Dakota Indians was discovered in the post-graduate planning of those who were presently attending college. If they had accepted the primary attitude of non-Indian college students that a degree was a means of personal gain, they tended to turn their backs on the reservation residents and move successfully into middle class American society. If, on the contrary, they had retained the attitude that a college degree provided increased opportunity to assist their own people, they generally planned to share their talents in reservation living.[5]

Other Factors Involved

Other generalizations regarding social change for the Dakota Indians could be given elaboration: (1) new cultural elements were more likely to be accepted if they satisfied some basic secondary drive of the Dakota people; (2) coercive policies of the agents of acculturation were less effective in bringing about changes that were permissive policies; and (3) many of the changes which have been underway on the reservation have been labeled "social problems" because differences in values between the two societies are exaggerated.[6]

Social Disorganization

It is hardly necessary to review the vast amount of evidence that has been gathered indicating that the reservation environment is highly disorganized. The non-ranching population living in the poverty and apathy of the small, isolated reservation community has consistently suffered from a variety of value conflicts which are revealed in behavior which is symptomatic of social disorganization.

While these conflicts in values can usually be traced back to the poverty of the reservation residents, it was likewise concluded that the non-ranching communities differed both in the qualifications and aspirations of their residents; that the individuals with the greatest poverty demonstrated the least aspiration; and that the people frequently expressed aspirations which were not in accord with their qualifications.[7]

Disorganization Explained

The conflict in values thesis provides a logical explanation for the disorganization which exists on the South Dakota reservations.

The thesis can be very simply stated: *In the process of socialization individuals are expected to make choices between conflicting values, and if these conflicts are not resolved, evidence of social disorganization will appear.*

Just as there may be conflicts in values for the individual, the whole society may also be disorganized. This appears to be the case for the Dakota Indians, and a recent study of their economy indicated some of the causes for the value conflicts associated with success in ranching on the reservation. A brief review of this study may demonstrate a specific application of the values conflict thesis.[8]

Factors Associated with Success in Ranching

The reservation community exhibits the qualities of a rural folk society—an isolated, familial way of life—that is antithetical to the values of modern industrial urbanism. In most cases socialization of young people causes them to oppose measurements of success weighed in the values of a money economy, but there are some who, perhaps because of broken families or isolated social circumstances, increasingly emulate the "city ways" and are in the process of transition to non-reservation society. The sharpest cultural contrasts are apparent between these two groups: (1) the traditional families living in non-ranching communities on the reservation that are still bound together by the remnants of kinship ties; and (2) the transitional families engaged in ranching who have accepted the non-reservation system of values in varying degrees depending upon how much they have changed their culture pattern.

Differences Apparent

Differences between non-ranchers (traditional) and ranchers (transitional) were apparent in social factors such as age, education, health, and family living, but the differences were even greater for economic variables such as housing, employment, job training, ownership, experience, and supplementary income. The change from traditional ways of sharing and generosity among the ranchers was further emphasized by the income differentials between the two groups. Nearly three-fourths of the ranching families had earned incomes which exceeded the reservation average, while less

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[4]Vernon D. Malan and Clinton J. Jesser, *The Dakota Indian Religion*, South Dakota Experiment Station Bulletin No. 473, S.D. State College.

[5]Vernon D. Malan, "Indian College Students Plan for the Future", *South Dakota Farm and Home Research*, Vol. X (May 1959), pp. 10-15.

[6]Vernon D. Malan, *Acculturation of the Dakota Indians*, Pamphlet No. 119 Rural Sociology Department, South Dakota State College, Brookings, South Dakota, 1956.

[7]Vernon D. Malan and Ernest L. Schusky, *The Dakota Indian Community*, South Dakota Experiment Station Bulletin No. 505.

[8]Vernon D. Malan, *The Dakota Indian Economy; Factors Associated With Success or Failure in Ranching*, South Dakota Experiment Station Bulletin to be published in 1963.

than one-sixth of the non-ranching families were this fortunate.

Ranchers Have Adopted New Way of Life

The modification of economic values among the ranchers means that the successful operator of a modern cattle enterprise has moved a very great distance away from the old camp circle. The value gap between the old-time, traditional Dakota patriarch and the modern ranch operator is interspersed with minority group members who have achieved assimilation in greater or lesser degree.

Acceptance Major Conflict

The major value conflict on the reservation then is in the degree of acceptance by the individual of the values of economic success and this is exemplified in the social and economic factors associated with success in ranching. The antecedent condition necessary to ranching success included such factors as adequate housing, education and training, knowledge of ranching, relatives living off the reservation, economic assistance from spouse, home ownership, job training, and employment in ranching. Once these conditions had been achieved then success was increased by these additional factors: (1) younger age; (2) more years of education; (3) experience living off the reservation; (4) special training courses; (5) supplementary income earned by other family members; (6) improved condition of housing; and (7) more children in the family. In some other cases, such factors as health problems, work preferences, attitudes toward spending tribal funds, experience in present job, and land ownership may contribute to economic success in ranching, but these require additional interpretation before their contribution can be determined.

The social and economic factors listed in the three categories (1) conditions, (2) contingencies, and (3) interpretations in the preceeding paragraph indicate the many areas of value conflict which arise from the basic conflict in economic values between the ranchers and non-ranchers.

Many of the conditions of the non-rancher, stemming primarily from indigency, are regarded as "social problems," and thus again the evidence of social disorganization is found in the social setting of the reservation where divergent value orientations have created situations in which the choice of values for the individual is between the traditional family sharing; permissive pattern; or the modern, individualistic, aggressive pattern of "economic success."

The system of analysis which attempts to measure value conflicts related to some standard or ideal of success, offers the benefit of a technique for predicting success in individual cases. Those reservation individuals possessing the traits in the three categories already listed, or having the potentiality of developing these traits, are obviously the best loan applicants or rehabilitation clients, and they should be given every encouragement to engage in ranching if personal interviews with the individuals confirm their interest and qualifications.

Implications for Future

The social system of the Dakota Indians is undergoing tremendous changes because of the impact of Western Civilization upon their traditional folk society. The socialization process no longer works as effectively on Dakota children, and they are forced into making unhappy choices between values of traditional and contemporary society. They are, in fact, faced with such basic value conflicts in the economic area that this dilemma colors every phase of their life, and in many cases, causes severe personality conflicts or personal disorganization for the individual. A study of the changes taking place in the Dakota Indian social system concluded with these paragraphs:

> "The contemporary situation is colored by its historical antecedents and is characterized by a retention of a few elements of traditional culture, adaption of some elements of Western American culture, and a great social vacuum in which there is no guide, no rule, no norm for individual behavior. This normlessness has resulted from the rapid collapse of traditional culture values. There has not been time for new norms to be learned to replace the old. The Dakotas have been reduced to a state of "anomie," of disheartening apathy, worthlessness, and rampant festering of social ills which run the gamut of known deviations. Dakota society is "neither fish, nor fowl"; the direction of acculturation has been reversed; and conflicts in personal and social values have prevented a concerted effort to generate any social movement which might hope to revitalize the reservation communities."

"Peaceful Change" Needed

In the future the story of the Dakotas needs revision, because it is still not too late to provide a happy ending. If anything is learned from the history of these brave people, the lesson should be clear that change cannot be made coercively, and that the goal should be to provide the Dakotas with means of adapting themselves to the larger society with a minimum of personal and social disorganization. The ideal of democratic "freedom of choice" is a crucial requirement which must be bolstered by increased opportunity to achieve any of these ends which they deem desirable. It is their fervent hope that a new social system can be peaceably and harmoniously created which will more adequately provide for their material, social, and cultural needs.[9]

This heartening conclusion must still be reached; the situation can hardly get any worse.

[9]Vernon D. Malan, *The Social System of the Dakota Indians*, Cooperative Extension Service Extension Circular 606, p. 18.

MESSAGE FROM THE DEAN AND DIRECTOR . . . . . .

Man has long used his knowledge and ingenuity to change the "normal" response of plants and animals to their environment to something more useful to him. This effort has been rewarded with a multitude of improved species and adapted varieties.

Dr. Bentley

In the twentieth century, Man has organized this search for agricultural improvement in agricultural experiment stations and associated field research substations.

The concepts of disease resistance, drought resistance, winter hardiness, high germination, standability, early maturity and many other characteristics desirable for specific environments have been discovered, studied, translated, into the seed stocks of cultivated crops at these stations. The relentless effort, too, has been directed at the animal species to bring about improved usefulness in prolificacy, mothering ability, feed intake and feed utilization, carcass quality, and a multitude of other specfic characteristics of utilitarian or esthetic value.

In South Dakota, the research substations, at Cottonwood, Eureka, Highmore, and Newell, were established more than 50 years ago, and have made significant contributions in testing and demonstrating the new crops and livestock knowledge to local people.

In response to local needs in southeast South Dakota, an Experiment Farm near Centerville was established 2 years ago and has already become a full fledged partner in the research program.

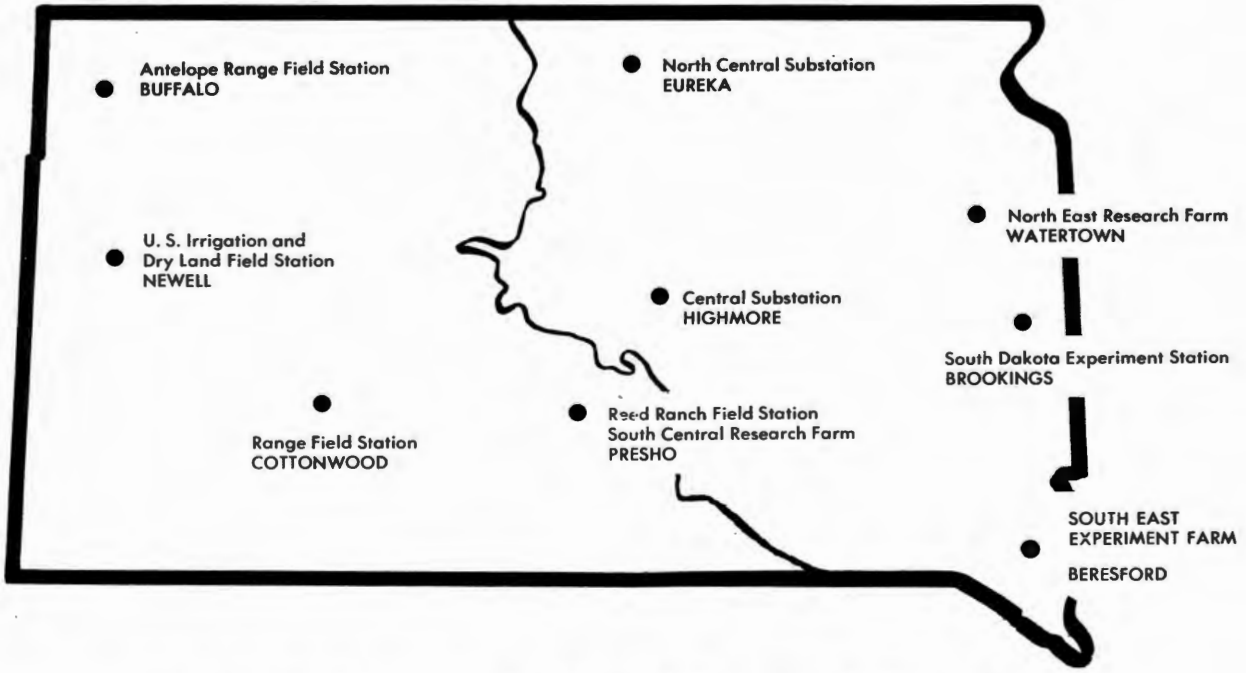
At a recent Presho meeting, our agronomy department head, Dr. L. O. Fine, told the group that it is fortunate that we have facilities in the area hit by rust, referring to the Presho substation. He pointed out that the wheat loss can conservatively be set at $25,000,000 in 1962, and that the substation provides a chance to study the problems first hand. "The problem can't be solved overnight," he explained, "but if breeders can stay with it, they could come up with winter wheat varieties not susceptible to rust."

Dr. Fine pointed out a specific example when he said that spring and winter wheat were grown side by side this year, at Presho. The spring wheat was not materially damaged by rust due to years of breeding rust resistant varities. Winter Wheat, of course, was hit hard.

Other substations could point out results of experiments with rate of grazing, area soil studies, soil mapping, irrigation of row crops and forages, in both East and West river areas, and dozens of others.

These statewide facilities bring to you the results of experimentation in all phases of agricultural research, through field day programs,and through the Cooperative Extension Service and your county agent.

ORVILLE G. BENTLEY
Dean of Agriculture and
Director of Experiment Station



South Dakota Agricultural Research Substations

WINTER EVENTS PREVIEW

CROP SHOWS

January

8-10—Hamlin County, Lake Norden
9—Marshall County, Britton
17-18—Grant County, Milbank
18-19—Roberts County, Sisseton
28-Feb.-2—Sioux Empire, Sioux Falls
31—Brown County, Hecla

February

1-2—Deuel County, Clear Lake
9-10—Day County, Webster

March

20-21—State Crop Show and Weed and Pest Conference, Brookings

OTHER EVENTS

January

21—Swine Field Day, Brookings
22—Swine Field Day, Redfield
23—Swine Field Day, Britton
24—Swine Field Day, Parkston
25—Swine Field Day, Beresford
24-25—Fertilizer Short Course, Huron

February

5-6—Farm and Home Show, Huron
5-6-7—Achievement Days, Freeman
11-15—Winter, Show, Watertown

March

6—Beef Field Day, South Dakota State College

AGRICULTURAL EXPERIMENT STATION
O. G. Bentley, Director
South Dakota State College
College Station, Brookings, South Dakota